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ABSTRACT

The possible utilities and limitations of computer-assisted career guidance systems (CACG) have been widely discussed although the effectiveness of CACG has not been systematically considered. This paper investigates the effectiveness of a theory-based CACG program, integrating Sequential Elimination and Expected Utility strategies. Three types of CACGs are examined: (1) Career Decision-Making (CDM) is a program that teaches theory-based career decision-making strategies; (2) Self-Directed Search-Computer Version (SDS-CV) is useful for clients who indicate a lack of adequate self-knowledge that relates personal characteristics to occupation; and (3) CHOICES has a strong emphasis on information access and retrieval. The results suggest that it is possible not only to integrate two decision-making strategies, but also that the integrated approach is effective in increasing students' vocational identity. The information approach (CHOICES) also had a significant long-term impact on students' vocational identity, but fell short of significant short-term effect. Students appear to favor the use of SDS-CV over CDM and CHOICES. The findings of this study may provide counseling practitioners with evaluative information for making purchasing decisions, but the paper cautions counselors from making decisions based on a single factor. (Contains 25 references and two tables.) (JDM)

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# Computer-Based Career Interventions

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The use of computer technology for career counseling has become a standardized practice among counseling professionals since its first introduction to the field. The possible utilities and limitations of computer-assisted career guidance systems (CACG) have been widely discussed (e.g., Harris-Bolsbey, 1984; Gati, 1995; Katz, 1993, Sampson, 1983). The cost analyses and the evaluation of CACG have also been documented (e.g., Sampson, Reardon, Humphreys, Peterson, Evans, & Domkowski, 1990). However, the effectiveness of CACG has not been systematically investigated as has other traditional counseling approaches. The majority of CACG studies were conducted during 70s and 80s. Due to the vast and rapid change of the delivery system and computer softwares, continued research and evaluation of the effectiveness of CACG is needed. The purpose of this study is to compare and evaluate relative effectiveness of different approaches to computer-based career interventions.

CACG systems provide many attractive features for experimental research on career decision-making, largely due to its standardization of treatment procedure and replicability of results (Jepsen, 1990). CACG systems also provide a linkage between theory and practice (Walsh & Savickas, 1996). Despite the potential of CACG, these systems have not received enough attention in the field of counseling psychology (Gati, 1996).

Although there are more than a dozen popular systems, studies have been unevenly focused on a few programs such as DISCOVER and SIGI. Most of the CACG studies concentrated on likability of these systems and its short-term effect. Very few studies focused on the effect of the systems on individuals' vocational identity or career development over an extended period of time. Moreover, CACG programs are complex systems, effects on users are likely the product of complex interaction, therefore, isolate components of a large system, and investigate the interactions with other system components is important (Jepsen, 1990).

Most of the CACG systems are designed to assist an individual in learnining about themselves (career assessment approach), or learning about the world of work (career exploration approach). Very few systems are designed to teach individuals about how to process career information. If the the ultimate goal of career intervention is to help individuals become independent and responsible career problem-solvers and decision-makers, then the teaching information processing skills and decision-making strategies must be developed (Sampson, Peterson, & Reardon, 1989).

Career decision-making is a complex process, by which individuals organize information about themselves and the world of work, deliberate among alternatives about actions, and make a public commitment to action (Jepsen, 1984). It has been strongly suggested that individuals usually lack cognitive capacity to process information about self and occupation (Gati, 1997; Glass & Holyoak, 1986; Kahneman & Tversky, 1979). Given the complexity of the decision-making process, and the limitations of human cognition, teaching individuals to understand the decision process and appropriate career decision-making strategies become critically important.

Studies (Egner & Jackson, 1978; Jepsen, Dustin, & Miars, 1982; Krumboltz, Scherba, Hamel, & Mitchell, 1982; Rubinton, 1980) have shown the effectiveness of direct teaching about decision-making strategies. Very few studies have investigated the effectiveness of teaching career-decision making via computers. Johnson (1985) used microcomputers to teach steps in the decision making process and help students learn how to use personal interest, values, and abilities to evaluate career options. He found that the students in the computer-assisted group perceived the career exploration to be more enjoyable and helpful than did students in the counselor-assisted group. Mau and Jepsen (1992) compared two theory-based decision-making models, Subjective Expected Utility and Sequential Elimination (described in the method section), using microcomputers. Results indicate a differential impact of the strategies on choice anxiety, choice certainty, and complexity of reasons for choosing a college major. Based on these findings and suggestions from Gati (1986), it may be

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hypothesized that computer programs that integrate two strategies may have a greater impact on individual's career decision-making tasks.

The purpose of this study is to investigate the effect of a computer program combining Expected Utilities and Elimination by Aspects decision strategies, on vocational identity and career exploratory behaviors. The relative effectiveness of different CACG approaches were also examined. Specifically, the following questions were addressed in this study:

A. Does teaching career decision-making strategies (CDM) result in a greater vocational identity and career exploratory behaviors?
B. How does CDM approach compare with career interest assessment approach (SDS), information approach (CHOICES), and a combination approach (SDS + CDM)? Which approach has greater long-term effects?
C. How are the CACG programs received by students?

Vocational identity is defined as the possession of a clear and stable picture of one's goals, interests, and talents (Holland, Johnston, & Asama, 1993). Vocational identity has been found to associate with Job satisfaction, vocational commitment, vocational attitude, positive career belief, desirable problem solving attitude, and rational decision-making style. The most popular use of this scale has been its use as a pre-/post criterion for evaluating career intervention (Holland et al., 1993).

Career exploratory behavior has been defined as those activities in which individuals seek to assess themselves and acquire information from the environment to assist with decision-making (Jordaan, 1963). Career exploratory behaviors have been shown to be predictive of vocational commitment (Blustein, 1989), vocational maturity (Yongue, Todd, & Burton, 1981), congruent occupational preference (Grotevant, Cooper, & Kramer, 1986), and confidence in one's vocational choice (Jepsen, 1975).

## Methods

### Sample

The sample is consisted of 108 (M = 26, F = 82) undergraduate students enrolled in human growth and development classes at a midwestern state university. Students (approximately 140) enrolled in these classes were primarily juniors and seniors. Of the 140 students, 121 agreed to participate. Of the 121 volunteers, 108 completed the study. Students who completed the study were given extra course credits. The mean age was 25.9 (SD = 6.8), ranging from 18 to 48. The majority of participants (over 90%) were Caucasians.

### CACG Programs

Three types of CACGs were examined. Program descriptions are briefly stated as followings:

Career Decision-Making (CDM). CDM is a computer-assisted instruction program that teaches theory-based career decision-making strategies. The computer instruction program was created by the author based on the decision-making models Sequential Elimination and the Subjective Expected Utility as described by Gati (1986) and Katz (1966). The Elimination strategy contains five sections : (a) Generating a list of choice possibilities; (b) Identifying a list of aspects; (c) Clarifying aspects; (d) Eliminating possibilities by aspects; and (e) Ordering the surviving alternatives. The Maximizing strategy contains 4 sections: (a) Identifying and comparing values, (b) Estimating expectancies, (c) Computing expected values, and (d) Evaluating the alternatives. For each section, instructions include learning objectives, activity instructions, and simulation exercises, i.e., Vocational Card Sort (Jones, 1980). A list of occupations and information resources, e.g., career placement services, is included in the computer program along with suggestions on how to search for additional, off-line information. Lichtenberg, Shaffer, and Arachtingi (1993) have also compared Subjective Expected Utility and Sequential Elimination decision models using a work sheet approach. Their study suggested that the Expected Utility model yielded significantly higher payoff.

Self-Directed Search - Computer Version (SDS-CV; PAR, 1987). As both a vocational assessment and an intervention design, the paper-pencil version of SDS has been shown to increase self-understanding, and the number of vocational options considered (Holland, Power, & Fritzsche, 1994). The creation of a computer version is intended to "extend the assessment and treatment where possible in ways compatible with Holland's most recent theory" (Reardon, 1987; p. 63 ). The SDS-CV items are identical with those of the paper-and pencil version. Using summary scale scores, Reardon and Loughead (1988) compared SDS and SDS-CV indicating a significant correlation. The SDS-CV provides

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an interpretive report including an overview of the six Holland types. The report also includes suggestions on how to use the SDS results in career and educational planning, and a list of reference materials. SDS-CV has been used to assist "those clients indicating a lack of adequate self-knowledge or schema with which relates to personal characteristics to occupations" (Reardon, Lenz, & Strausberger, 1996; p. 213).

Heuristic Occupational Information and Career Exploration System (CHOICES, Careerware, 1996). CHOICES has a strong emphasis on information access and retrieval. There are five modules in the Choices program: (a) Guided Access, (b) Tutorial, (c) Planner, (d) Assessment, and (e) Quick Access. In this study only the Guided Access module was used to represent the information approach of the CACG interventions. The Guided Access module contains a search function that allow individuals to explore occupations based on their selected criteria such as interest, aptitude, temperaments, etc. This module also allows individuals to compare two or three occupations, and search related occupations. Studies have indicated that CHOICES was well received (e.g., Reardon, Bonnell, & Huddleston, 1982), and increased career decision making commitment of college students (e.g., Pinder & Fitzgerald, 1984).

Procedure

Students who participated in this study were randomly assigned to one of six groups: (1) CDM, (2) SDS, (3) Choices, (4) SDS + CDM, (5) wait-listed control, and (6) Holdout group. A total of 25 two-hour sessions were scheduled over a two week period. Due to limited availability of computers and the software programs, seven participants were assigned to a different group because none of the originally assigned group sessions fit their schedule. Consequently, each session varied with a number of students participating. In each session, a graduate research assistant was available for introducing the computer system and answering questions.

Students who participated in any of the first four CACG groups completed the My Vocational Situation questionnaire (MVS) one week before they received the treatment, and were administered the MVS and a computer program evaluation questionnaire immediately after the treatment. A career exploratory behavior checklist and MVS were administered to the treatment group six months after they received the treatment. Students in the wait-listed control group completed MVS twice in the same one-week period before they received the treatment. Students in the hold-out group were administered MVS and the career exploratory behaviors checklist during the follow-up period. Students in the hold-out group received no treatment during the research study period.

Instrument

Vocational Identity. My Vocational Situation (Holland, Daiger, & Power, 1980) measured vocational identity, the need for information, and perceived barriers to career decision-making. The vocational identity scale, consisted of 18 items, is defined as " the possession of a clear and stable picture of one's goal, interests, personality, and talents" (p.1., Holland, et al., 1980). The score reliability (KR 20) is .89 for 291 college males, and .88 for college females. MVS has been gaining empirical support as a valid diagnostic tool (Holland, et al., 1993; Lucas, Gysbers, Buescher, & Heppner, 1988).

Career Exploratory Behaviors. A checklist including 20 possible sources of information was developed by the author. Participants were asked to indicate how often they had sought each information since they received CACG. Both the number of sources and the total frequencies of information sought were assessed.

Satisfaction Ratings. Students' satisfaction with the program was measured based on a questionnaire composed of 10 self-descriptive statements, for example, "Using this program helped me to make the educational/vocational decisions." Items were derived from several studies, including Zener and Schnuelle (1972), Ryan and Drummond (1981), and Mau and Jepsen (1992). Students rated each of the 10 statements using a 5-point Likert scale (from 1, strongly disagree, to 5, strongly agree). For the first eight statements, a high rating (3 and above) indicated a positive reaction to the program utilized; for the last two statements, a high rating indicated a negative reaction toward the program. Ratings for the last two items were reversed when the total satisfaction ratings were computered. The alpha coefficient estimated for this sample was .76.

## Results

Pre-test and posttest differences in vocational identity among CACG and wait-list control groups were examined using a 5 (group) by 2 (sex) analyses of variance (ANOVA). Pre-test and follow-up test differences in vocational identity and career exploratory behaviors among CACG and Hold-out groups were also examined using a 5 x 2 ANOVA. Perceived satisfaction with CACG programs (i.e., CDM, SDS-CV, and Choices) was examined using one-way ANOVA.

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Table 1 provides means and standard deviations of vocational identity scores by groups and geader. Results of ANOVA indicate a significant short-term gain in vocational identity for groups, $F(4, 87) = 2.69$, $p < .037$. There were no significant gender differences or group by gender interaction. Post hoc analysis indicated that students who participated in the CDM group ($M = 2.32$) had a significant short-term gain on vocational identity than students who received no treatment ($M = 0.28$). Results of ANOVA also indicate a significant long-term gain in vocational identity for groups, $F(4, 69) = 3.29$, $p < .017$. Post hoc analysis showed that students in CDM ($M = 2.76$), or Choices group ($M = 3.71$) had a significant long-term gain than the hold-out group ($M = 0.90$).

Table 2 provides means and standard deviations of career exploratory behaviors by group and gender. Results of ANOVA indicate a significant group by sex interaction for source of information explored, $F(4, 69) = 3.03$, $p < .024$, and in the total frequencies of information sought , $F(4, 87) = 3.49$, $p < .013$. Post hoc analyses showed that male participants in the CDM group ($M = 11.2$) sought significantly more sources of information than male participants in the hold-out group ($M = 5.0$).

ANOVA showed a significant difference in satisfaction ratings among different CACG program, $F(2, 55) = 4.42$, $p < .017$. On the average, students who used the SD-CV program ($M = 43.1$, $SD = 5.1$) reported greater satisfaction than those who used CDM ($M = 36.0$, $SD = 7.9$) or CHOICES ($M = 36.9$, $SD = 8.4$) program. No significant gender difference were found.

## Discussion

This study investigated the effectiveness of a theory-based CACG program, integrating Sequential Elimination and Expected Utility strategies. Results suggested that it is not only possible to integrate two decision making strategies, but also indicated that the integrated approach is effective in increasing students' vocational identity. Teaching career decision-making strategies using micro-computer not only resulted in a short-term gains in students' vocational identity, this effect seems to have a long lasting impact. The information approach (Choices) also had a significant long-term impact on students' vocational identity, but fell short of significant short-term effect. Although SDS-CV did not significantly raise students' vocational identity scores, students appeared to favor the use of SDS-CV over CDM and Choices.

Unexpectedly, the combined approach (SDS+CDM) did not significantly increase students' vocational identity. Several possible explanations are contemplated. The arrangement to do both computer programs were difficult to make, consequently, fewer students showed up for the experiment. The considerably smaller sample size for the combined approach may have resulted in lacking statistical power for a significant effect. It is also possible that ceiling effect may be a factor for this non-significant finding. University career counseling clients typically have a average vocational identity score of 8 (Reardon, 1997; personal communication), the sample from this study consisted of primarily junior and senior university students who were likely to have their career goals well thought out and formulated.

Consistent with other studies (Johnson, 1985; Miller, Karriker, & Springer, 1986), the present study did not show gender effects of these treatment programs on vocational identity. However, gender and treatment interaction was found for the measure of vocational exploratory behavior. Male students in the CDM group sought significantly more sources of information than male participants in the hold-out group. The fact that the CDM program does not contain occupational information, and its provision of strategy to obtain off-line information, seemed to have motivated male students than female students to seek information from diverse sources. However, due to a relatively small male sample size in each group, one should interpret the findings with reservation and make tentative conclusions.

Vocational identity and vocational exploratory behavior are generally considered two important predictors for a variety of career behaviors and major career intervention goals. Given the complexity of decision-making process, and the limitations of human information processing, computer-assisted career intervention programs can be used to break down information into "bits" and "pieces," therefore, reduce the "information overload." Teaching career decision-making can consume a great deal of a counselor's time. The use of CACG for teaching career decision-making not only enhances counselors productivity, but also becomes a logical solution for often criticized compensatory decision model (Gati, 1997; Glass & Holyoak, 1986; Tversky, 1975).

The findings of this study may provide counseling practitioners with evaluative information for making purchase decisions. Although students were more satisfied with the SDS program, both CDM and Choices programs were rated



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positively. More than 50% of students from either program indicated that they will suggest their friends to use the program. However, counselors should avoid making decisions based on single factor. Cost-effect analysis (e.g., Sampson, et al., 1990) would provide useful information to the practitioners.

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Table 1
Means and Standard Deviations of Vocational Identity By Treatment Groups and Gender

| | Pretest | Posttest | Follow-up |
|---|---|---|---|
| CDM (n = 23) | | | |
| M | 13.1 | 15.5 | 16.4 |
| SD | 2.8 | 2.4 | 1.5 |
| SDS (n = 14) | | | |
| M | 13.6 | 14.1 | 15.0 |
| SD | 3.6 | 4.0 | 3.2 |
| CHOICES (n = 21) | | | |
| M | 11.0 | 12.3 | 14.8 |
| SD | 4.4 | 4.6 | 3.2 |
| SDS+CDM (n = 13) | | | |
| M | 12.9 | 14.9 | 15.0 |
| SD | 3.8 | 3.5 | 3.1 |
| Wait-Listed Control ( n = 16) | | | |
| M | 13.3 | 13.6 | -- |
| SD | 3.7 | 3.9 | -- |
| Hold-Out Group (n = 21) | | | |
| M | 14.7 | -- | 15.4 |
| SD | 2.6 | | 2.1 |
| Males (n = 26) | | | |
| M | 13.7 | 14.1 | 15.3 |
| SD | 3.8 | 4.0 | 3.1 |
| Females ( n = 82) | | | |
| M | 12.8 | 14.8 | 15.6 |
| SD | 3.7 | 3.5 | 2.7 |

Note. Students in the Hold-out group only participated in the follow-up study. Students in the wait-listed control group used either the CDM or CHOICES program after the posttest was administered. Average scores and standard deviations for VI is 14.2/3.4. The higher the VI score the greater the career certainty.

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Table 2

Means and Standard Deviations of Exploratory Behaviors By Treatment Groups and Gender

| Treatment Groups | Number of Sources Explored | | Frequency of Exploration | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| CDM | | | | |
| M | 11.2 | 6.2 | 59.2 | 19.6 |
| SD | 3.1 | 2.6 | 34.4 | 18.5 |
| SDS | | | | |
| M | 6.0 | 6.0 | 59.5 | 19.4 |
| SD | 2.8 | 3.3 | 55.9 | 14.4 |
| CHOICES | | | | |
| M | 5.5 | 7.6 | 11.5 | 27.7 |
| SD | 4.5 | 3.1 | 10.8 | 30.5 |
| SDS+CDM | | | | |
| M | 9.3 | 8.1 | 38.3 | 25.9 |
| SD | 3.1 | 2.7 | 24.7 | 16.5 |
| Hold-Out Group | | | | |
| M | 5.0 | 6.1 | 19.8 | 17.4 |
| SD | 2.8 | 2.4 | 21.2 | 10.6 |

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